FIG. 1

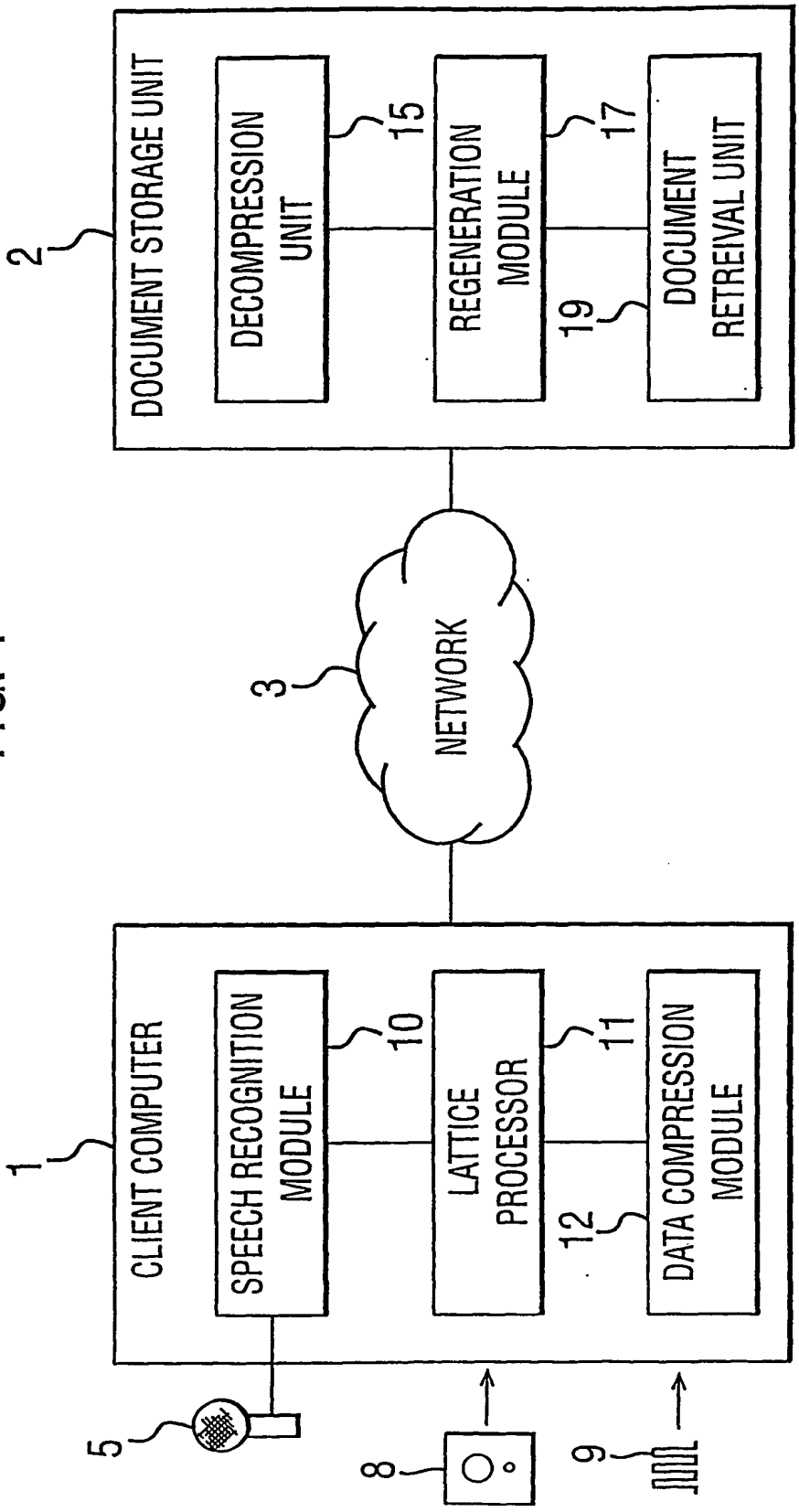

DOCUMENT STORAGE UNIT
2
DECOMPRESSION UNIT
15
REGENERATION MODULE
17
19
DOCUMENT RETREIVAL UNIT
NETWORK
3
CLIENT COMPUTER
1
SPEECH RECOGNITION MODULE
10
LATTICE PROCESSOR
11
12
DATA COMPRESSION MODULE
5
8
9

FIG. 2

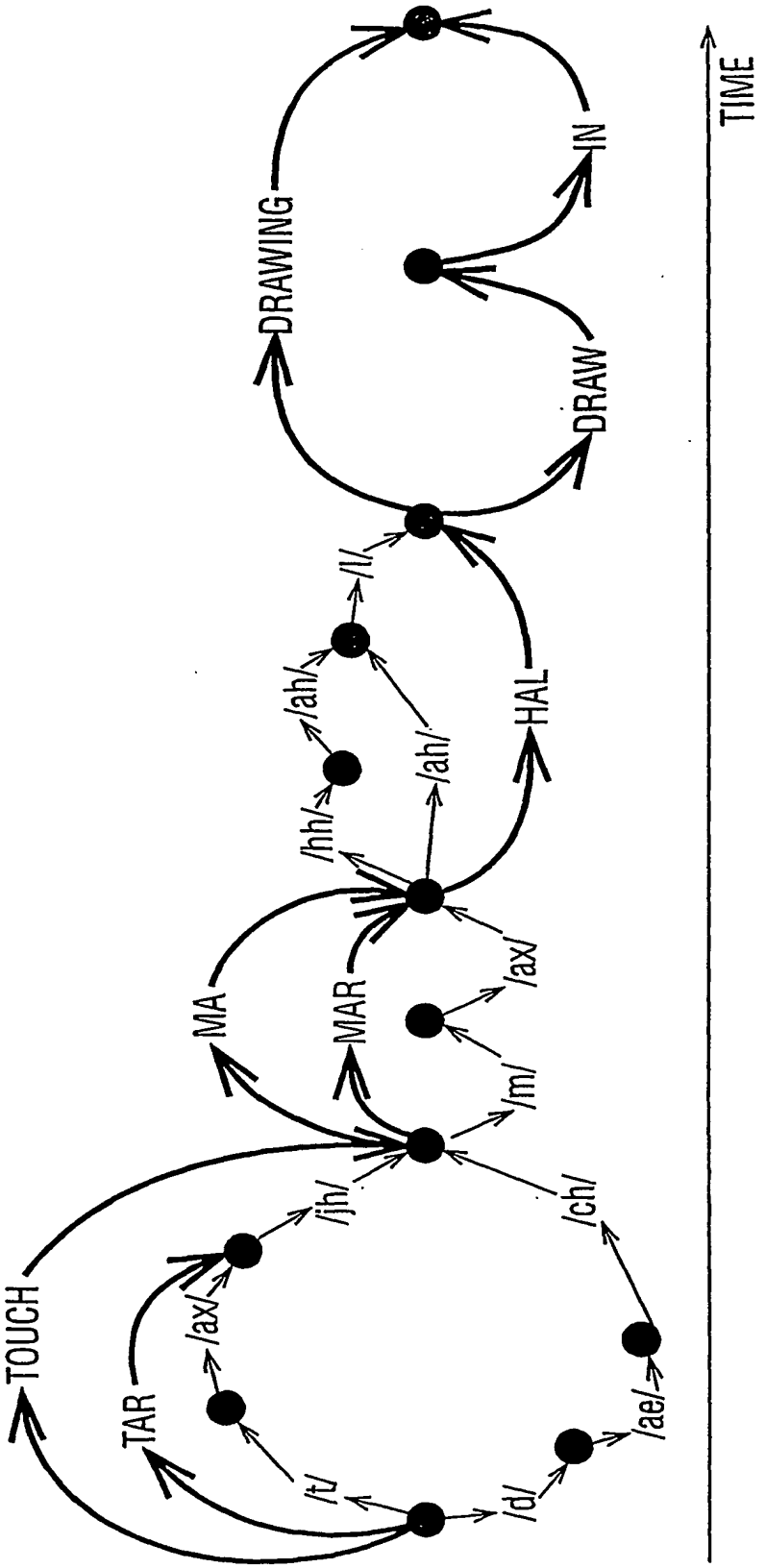

TOUCH
TAR
/ax/
/t/
/d/
/jh/
/ch/
/ae/
/m/
MA
MAR
/ax/
/hh/
/ah/
/ah/
/l/
HAL
DRAWING
DRAW
IN
TIME

FIG. 3

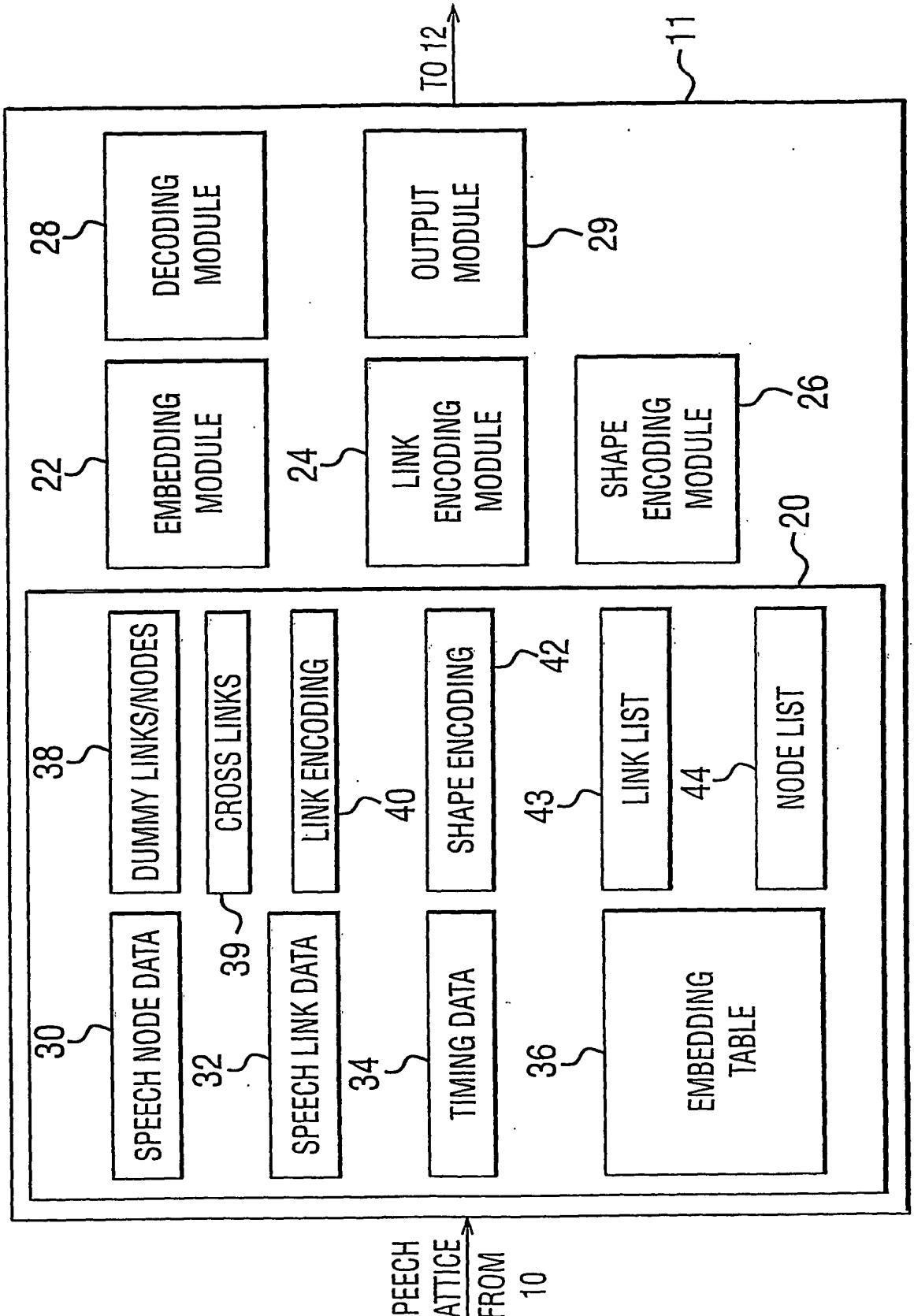

TO 12
11
28
DECODING MODULE
OUTPUT MODULE
29
22
EMBEDDING MODULE
24
LINK ENCODING MODULE
SHAPE ENCODING MODULE
26
20
38
DUMMY LINKS/NODES
CROSS LINKS
LINK ENCODING
40
SHAPE ENCODING
42
43
LINK LIST
44
NODE LIST
30
SPEECH NODE DATA
32
39
SPEECH LINK DATA
34
TIMING DATA
36
EMBEDDING TABLE
SPEECH LATTICE FROM 10

FIG. 4

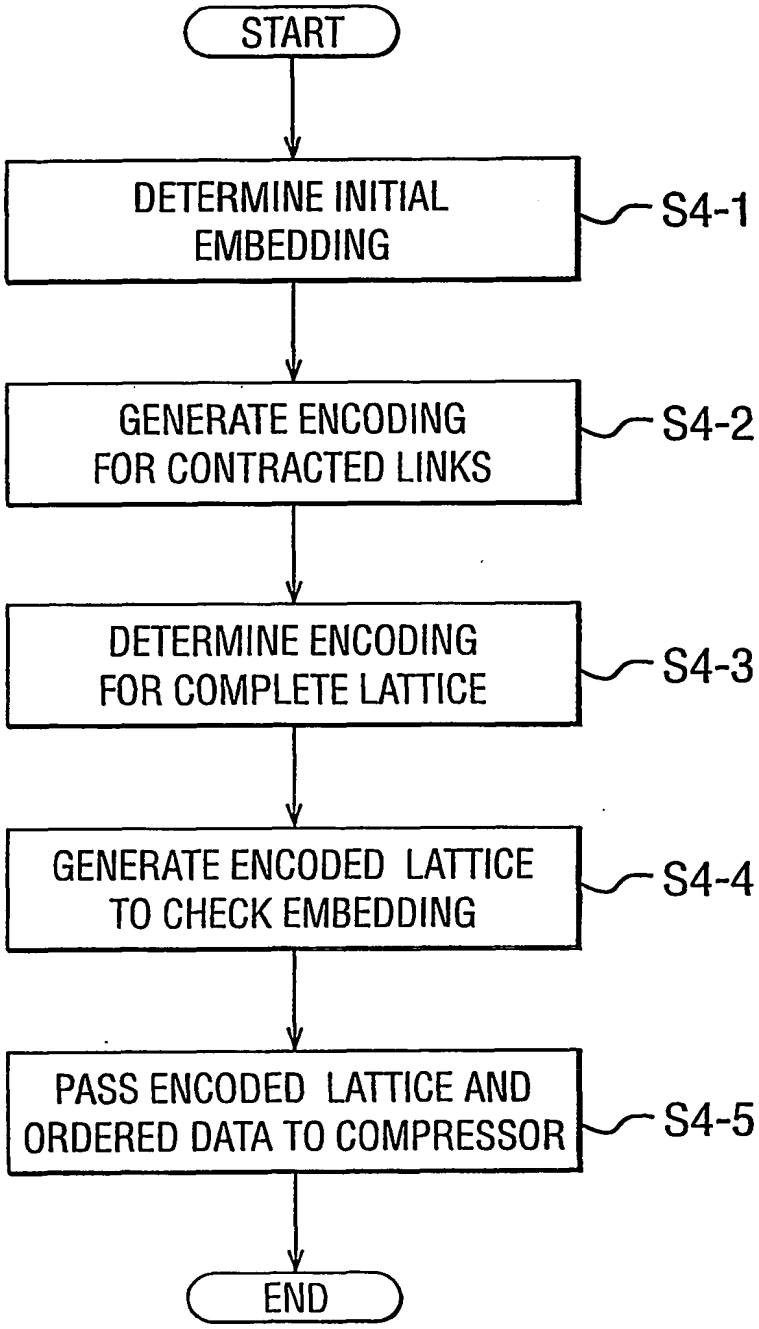

START
DETERMINE INITIAL EMBEDDING
S4-1
GENERATE ENCODING FOR CONTRACTED LINKS
S4-2
DETERMINE ENCODING FOR COMPLETE LATTICE
S4-3
GENERATE ENCODED LATTICE TO CHECK EMBEDDING
S4-4
PASS ENCODED LATTICE AND ORDERED DATA TO COMPRESSOR
S4-5
END

FIG. 5

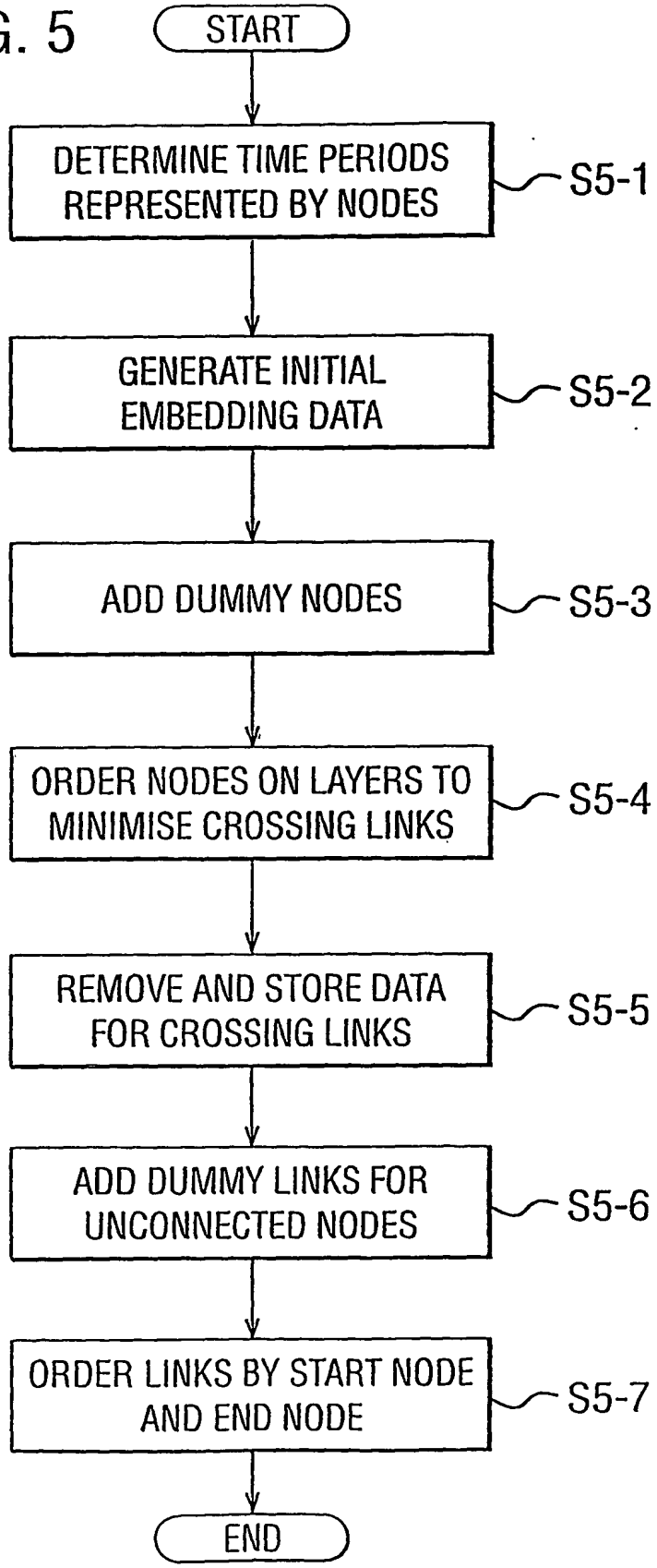

START
DETERMINE TIME PERIODS REPRESENTED BY NODES
S5-1
GENERATE INITIAL EMBEDDING DATA
S5-2
ADD DUMMY NODES
S5-3
ORDER NODES ON LAYERS TO MINIMISE CROSSING LINKS
S5-4
REMOVE AND STORE DATA FOR CROSSING LINKS
S5-5
ADD DUMMY LINKS FOR UNCONNECTED NODES
S5-6
ORDER LINKS BY START NODE AND END NODE
S5-7
END

FIG. 6A

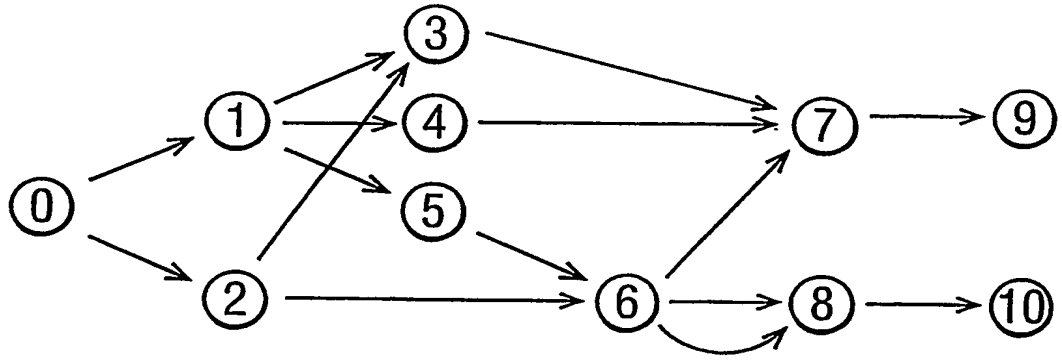



FIG. 6B

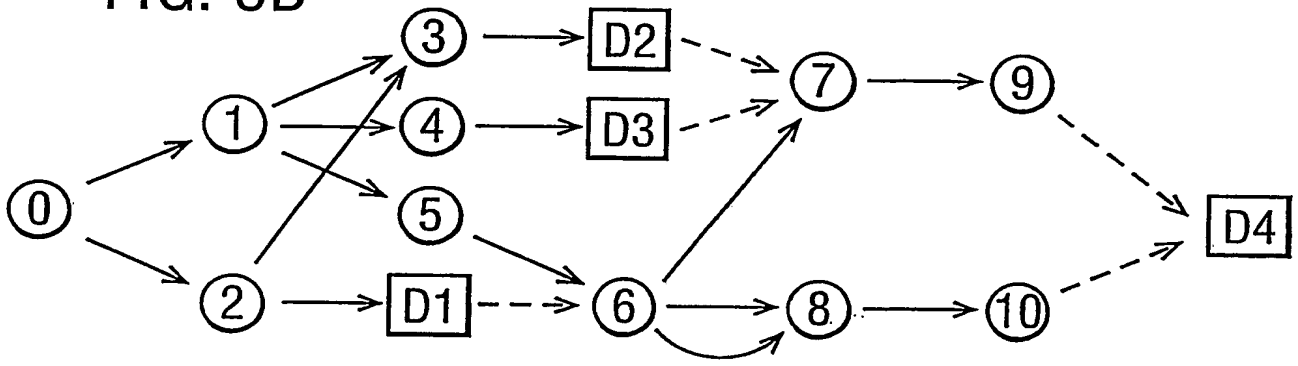



FIG. 6C

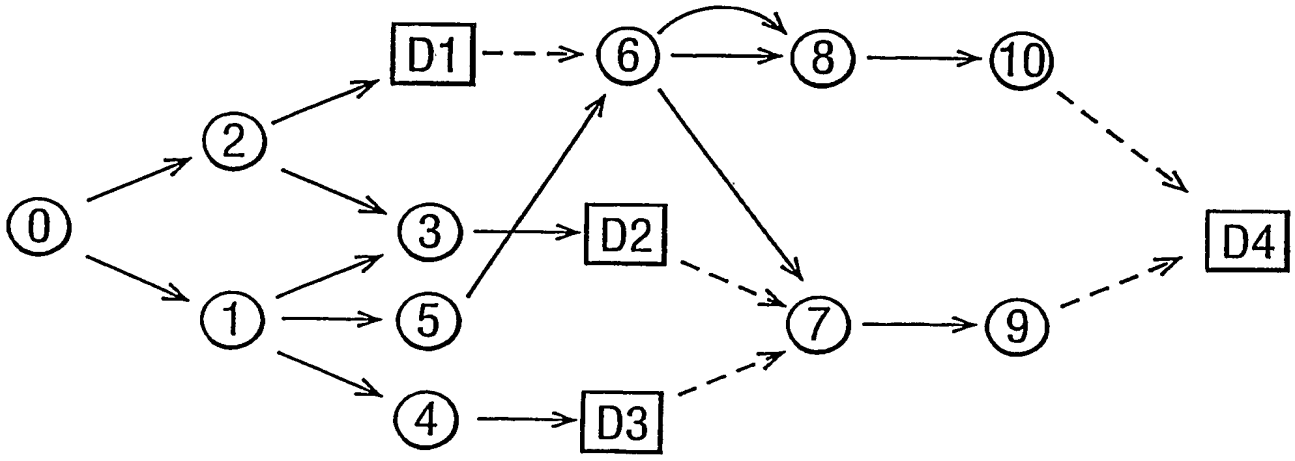


FIG. 6D

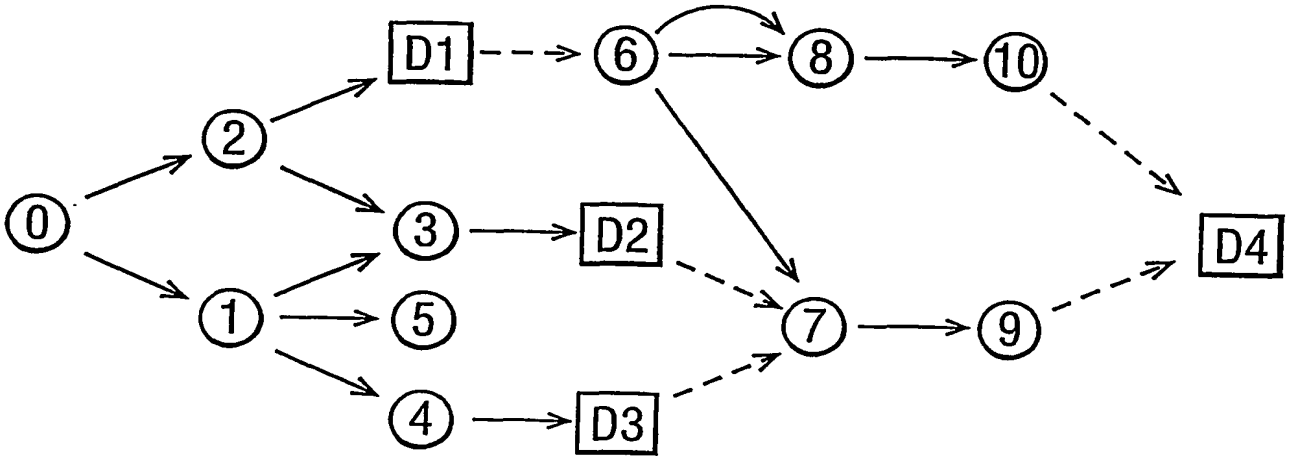



FIG. 6E

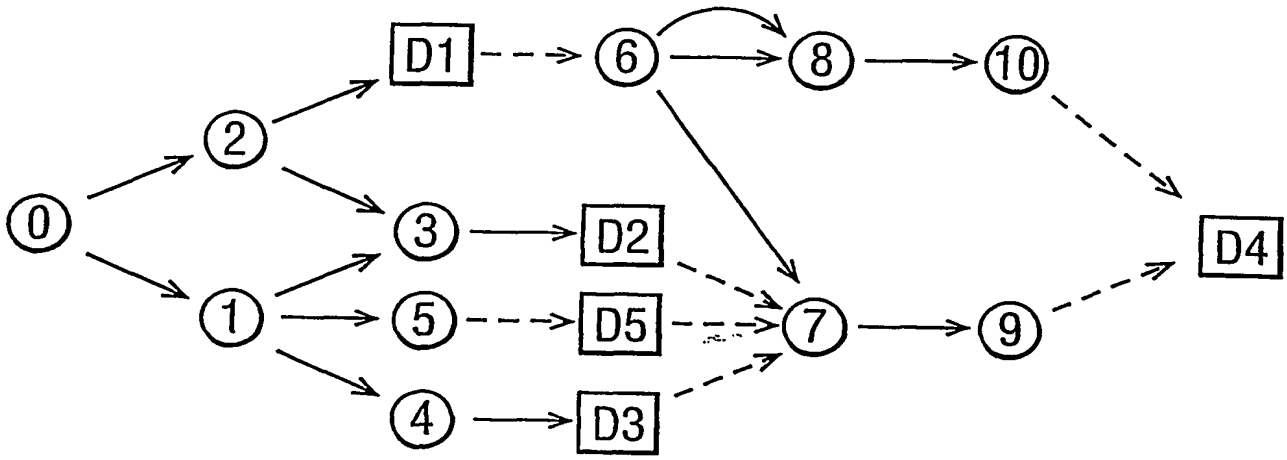


FIG. 7

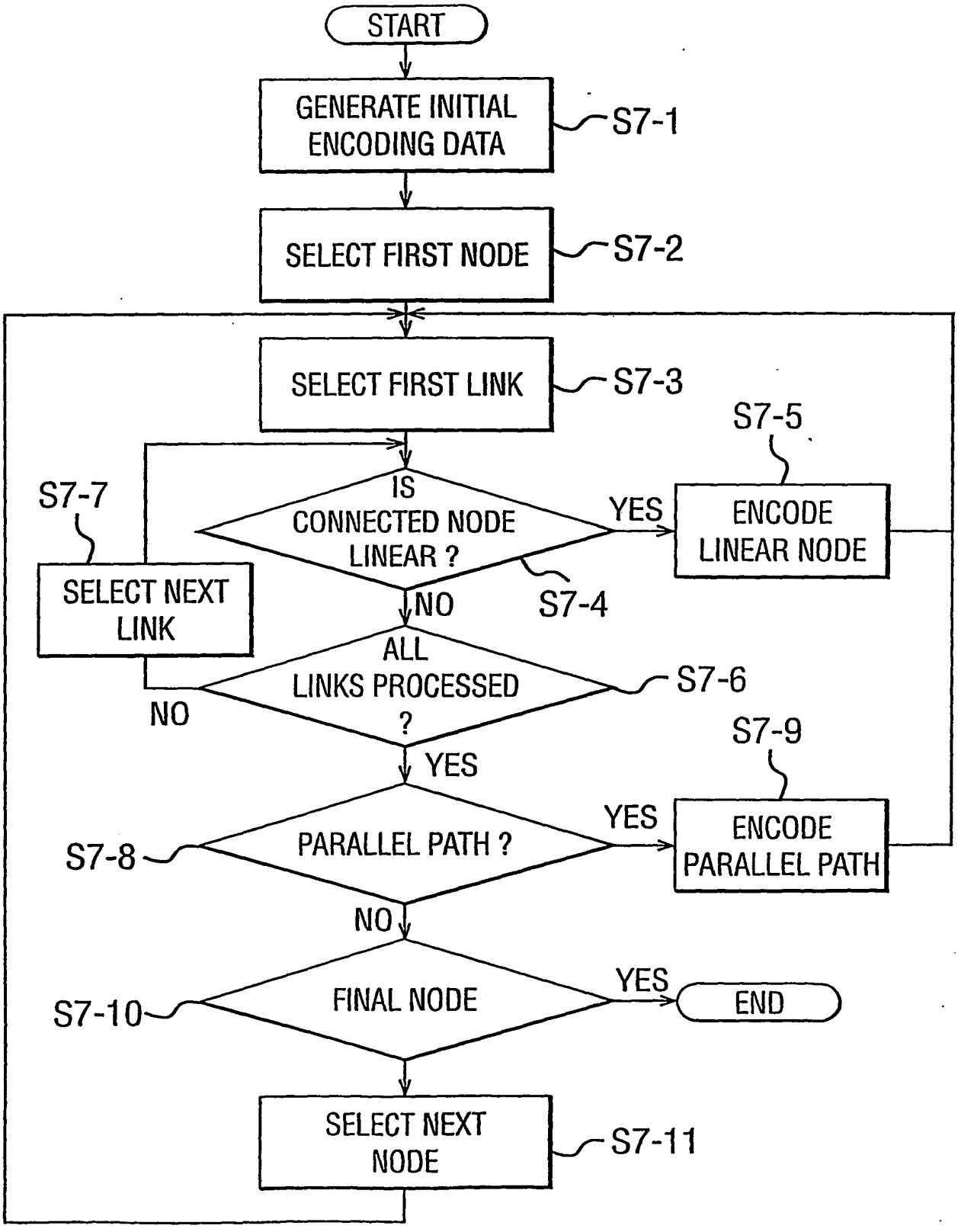

START
GENERATE INITIAL ENCODING DATA
S7-1
SELECT FIRST NODE
S7-2
SELECT FIRST LINK
S7-3
S7-5
S7-7
IS CONNECTED NODE LINEAR ?
YES
ENCODE LINEAR NODE
SELECT NEXT LINK
NO
S7-4
ALL LINKS PROCESSED ?
S7-6
NO
S7-9
YES
PARALLEL PATH ?
YES
ENCODE PARALLEL PATH
S7-8
NO
FINAL NODE
YES
END
S7-10
SELECT NEXT NODE
S7-11

FIG. 8A

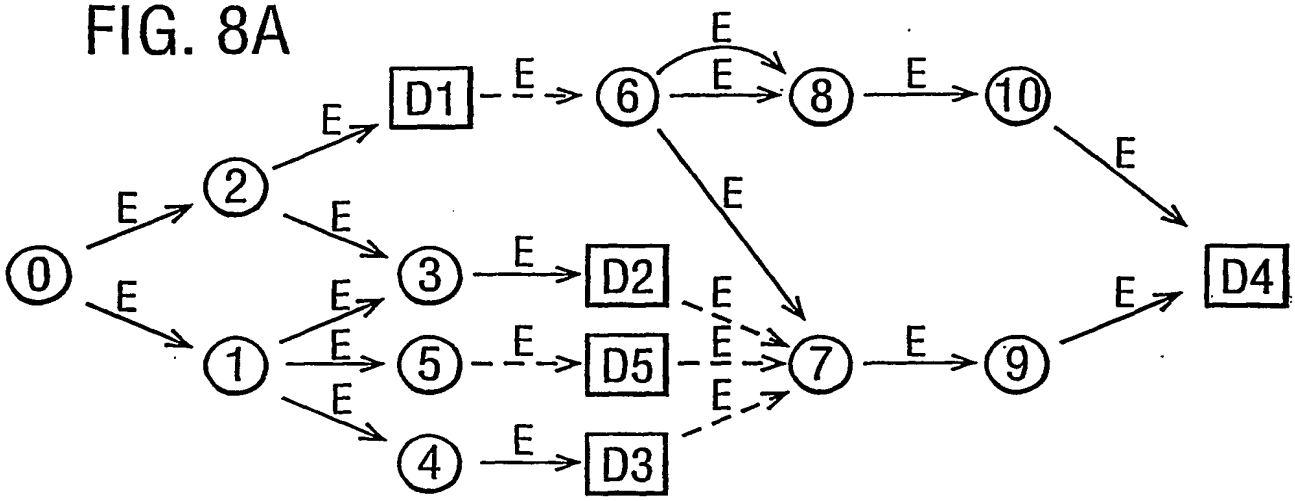

0
1
2
3
4
5
6
7
8
9
10
D1
D2
D3
D4
D5
E

FIG. 8B

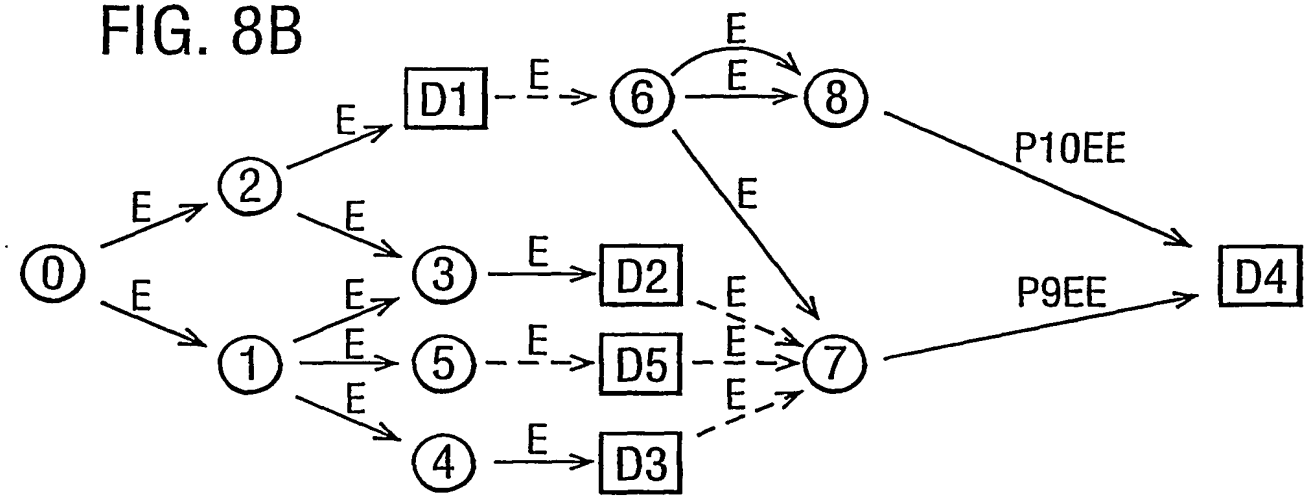

0
1
2
3
4
5
6
7
8
D1
D2
D3
D4
D5
E
P10EE
P9EE

FIG. 8C

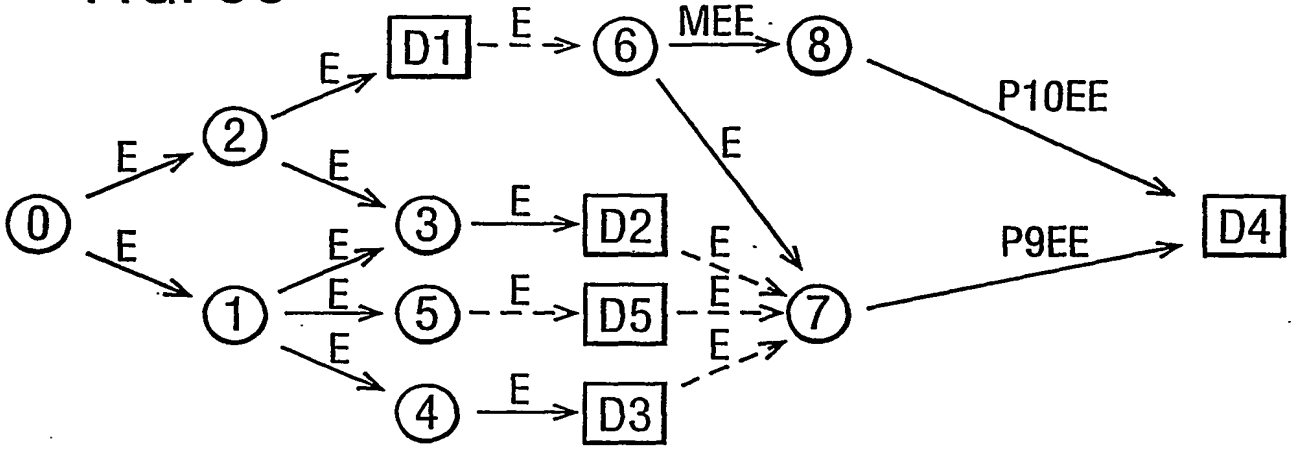

0
1
2
3
4
5
6
7
8
D1
D2
D3
D4
D5
E
MEE
P10EE
P9EE

FIG. 8D

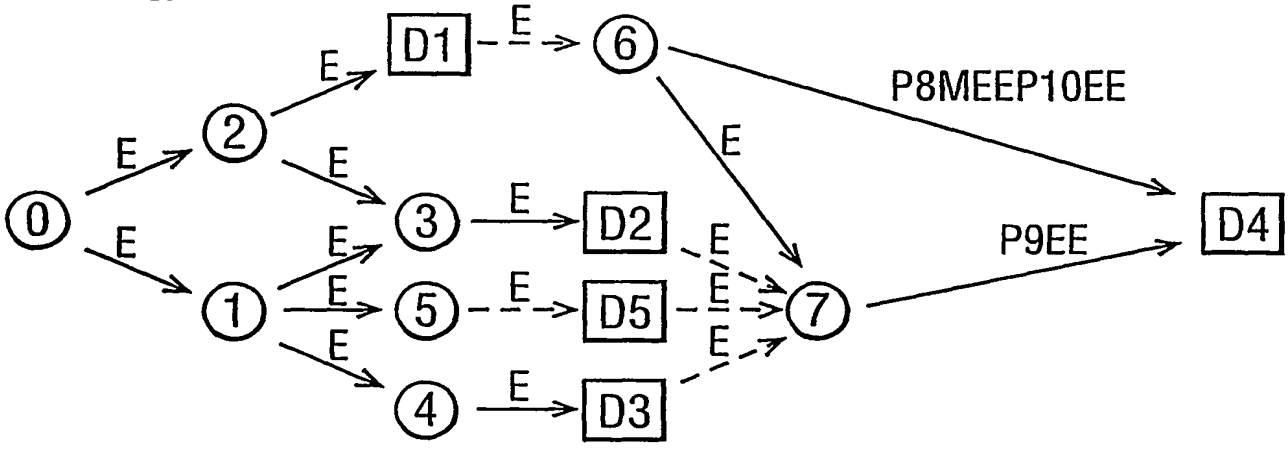

0
1
2
3
4
5
6
7
D1
D2
D3
D4
D5
E
P8MEEP10EE
P9EE

FIG. 8E

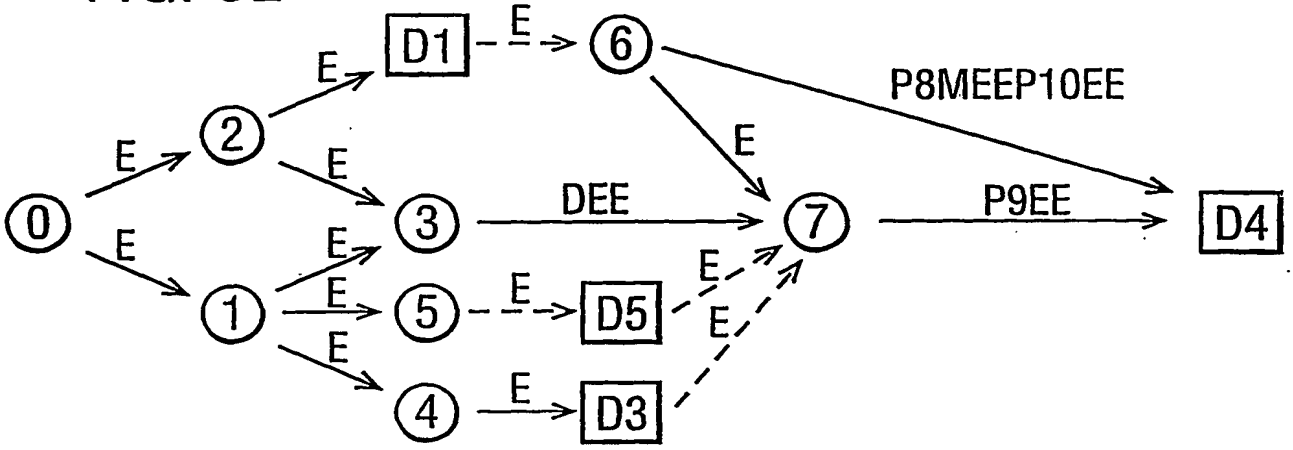

D1
E
6
P8MEEP10EE
E
E
2
E
E
DEE
P9EE
D4
0
E
E
3
7
E
E
E
E
1
5
E
D5
E
E
4
E
D3

FIG. 8F

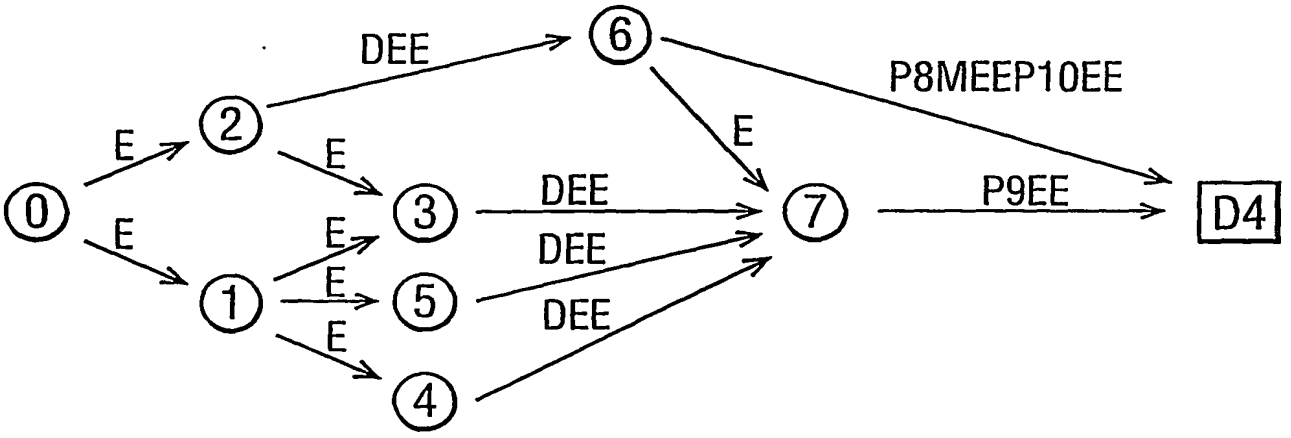

DEE
6
P8MEEP10EE
E
2
E
E
DEE
P9EE
D4
0
E
E
3
7
DEE
E
E
1
5
DEE
E
4

FIG. 8G

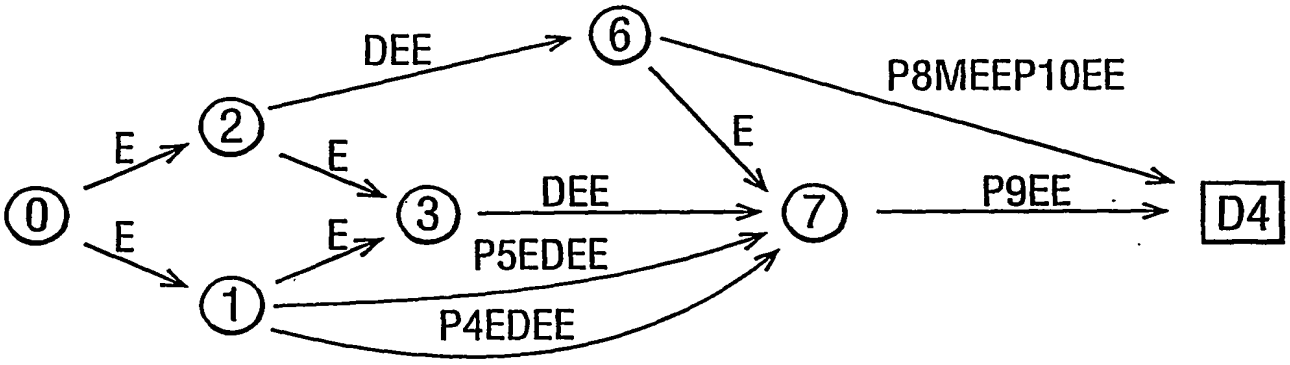

DEE
6
P8MEEP10EE
E
2
E
E
0
3
DEE
7
P9EE
D4
E
E
P5EDEE
1
P4EDEE

FIG. 8H

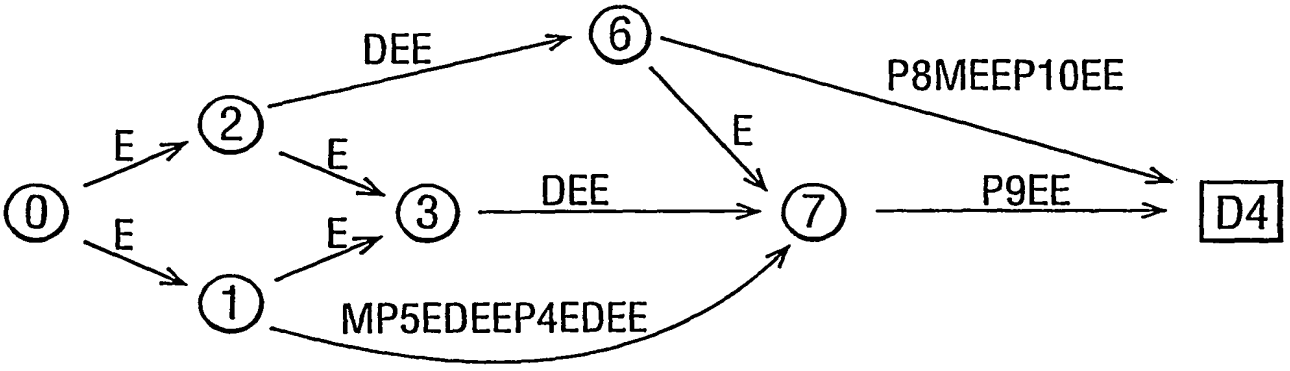

DEE
6
P8MEEP10EE
E
2
E
E
0
3
DEE
7
P9EE
D4
E
E
1
MP5EDEEP4EDEE

FIG. 9A

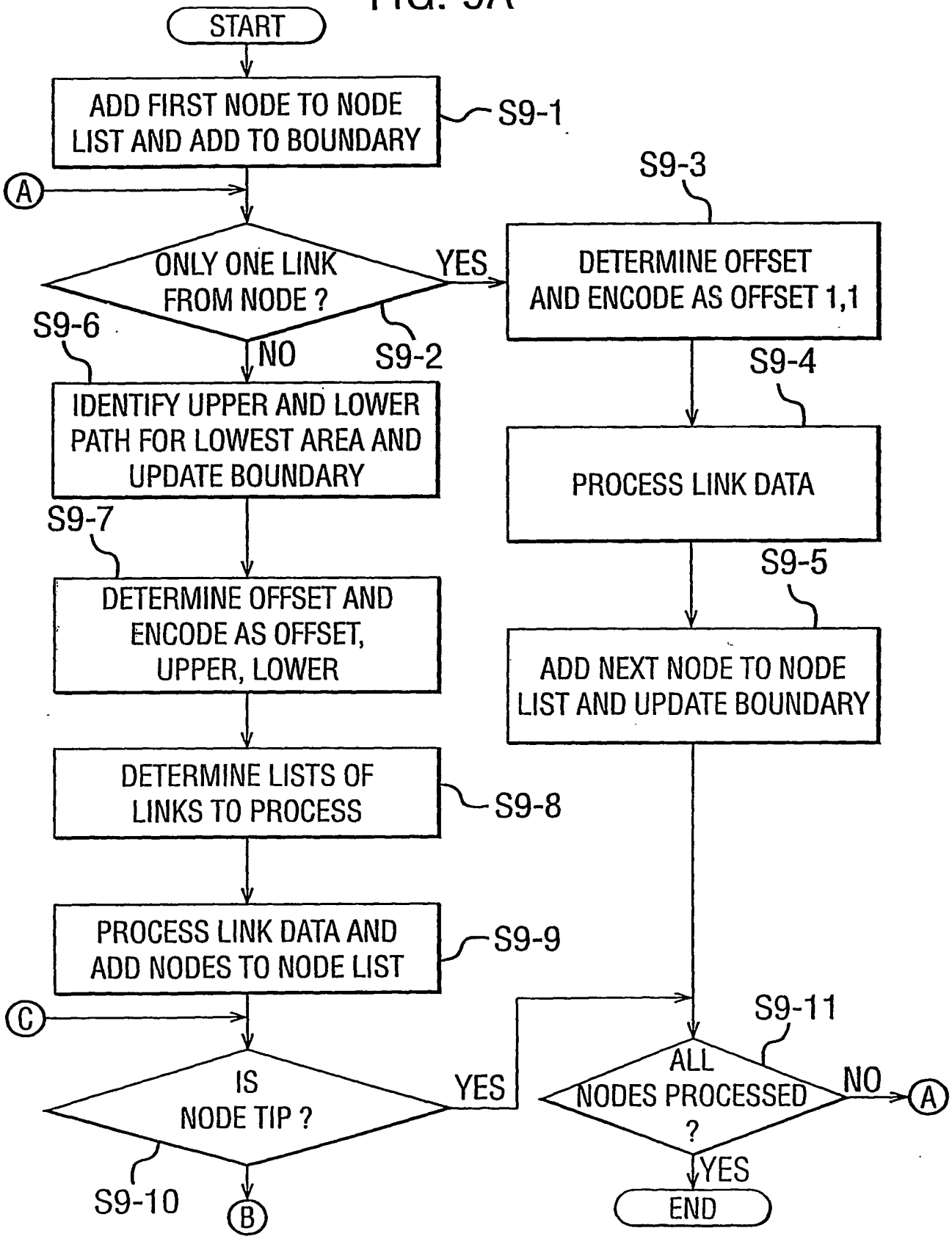

START
ADD FIRST NODE TO NODE LIST AND ADD TO BOUNDARY
S9-1
A
ONLY ONE LINK FROM NODE ?
YES
NO
S9-2
S9-3
DETERMINE OFFSET AND ENCODE AS OFFSET 1,1
S9-4
PROCESS LINK DATA
S9-5
ADD NEXT NODE TO NODE LIST AND UPDATE BOUNDARY
S9-6
IDENTIFY UPPER AND LOWER PATH FOR LOWEST AREA AND UPDATE BOUNDARY
S9-7
DETERMINE OFFSET AND ENCODE AS OFFSET, UPPER, LOWER
DETERMINE LISTS OF LINKS TO PROCESS
S9-8
PROCESS LINK DATA AND ADD NODES TO NODE LIST
S9-9
C
IS NODE TIP ?
YES
S9-10
B
S9-11
ALL NODES PROCESSED ?
NO
A
YES
END

FIG. 9B

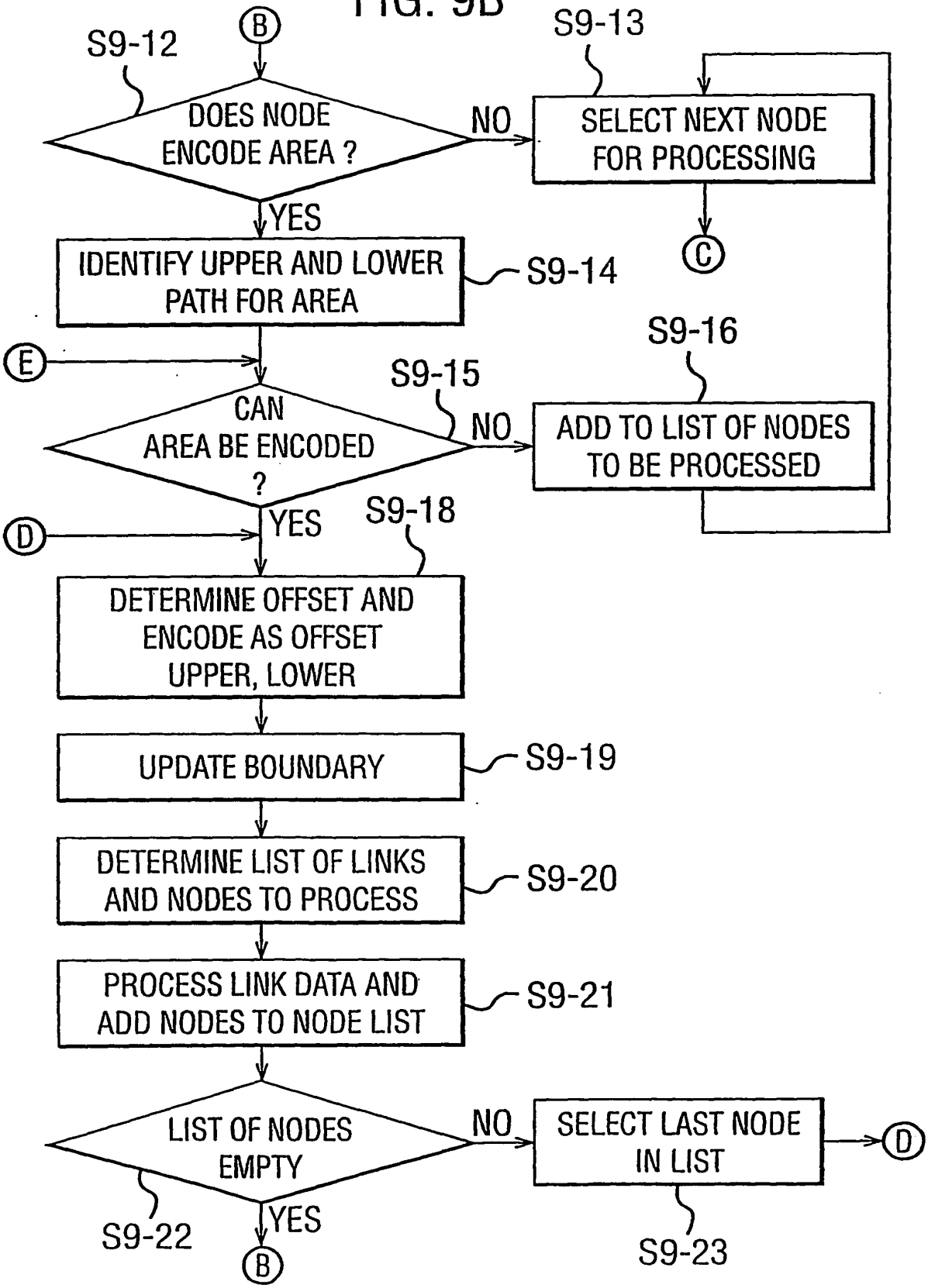

B
S9-12
DOES NODE ENCODE AREA ?
NO
S9-13
SELECT NEXT NODE FOR PROCESSING
C
YES
IDENTIFY UPPER AND LOWER PATH FOR AREA
S9-14
E
S9-16
S9-15
CAN AREA BE ENCODED ?
NO
ADD TO LIST OF NODES TO BE PROCESSED
D
YES
S9-18
DETERMINE OFFSET AND ENCODE AS OFFSET UPPER, LOWER
UPDATE BOUNDARY
S9-19
DETERMINE LIST OF LINKS AND NODES TO PROCESS
S9-20
PROCESS LINK DATA AND ADD NODES TO NODE LIST
S9-21
LIST OF NODES EMPTY
NO
SELECT LAST NODE IN LIST
D
S9-22
YES
B
S9-23

FIG. 10A

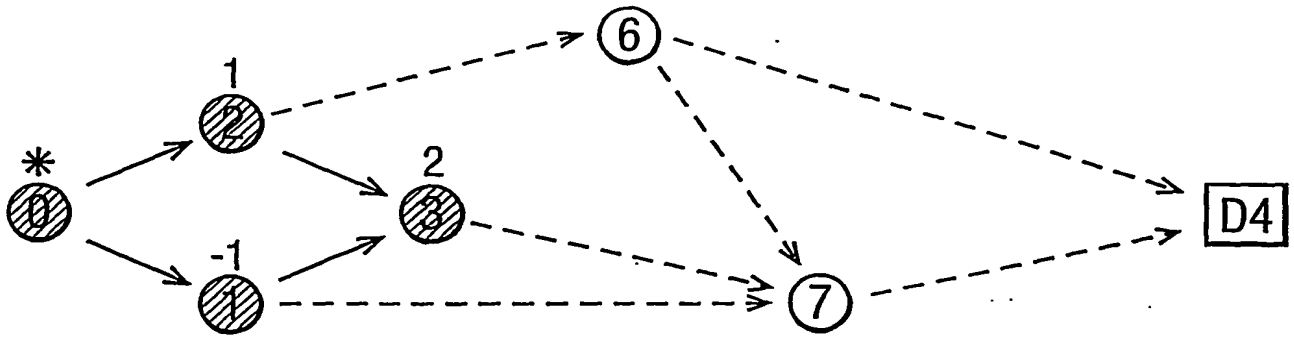



FIG. 10B

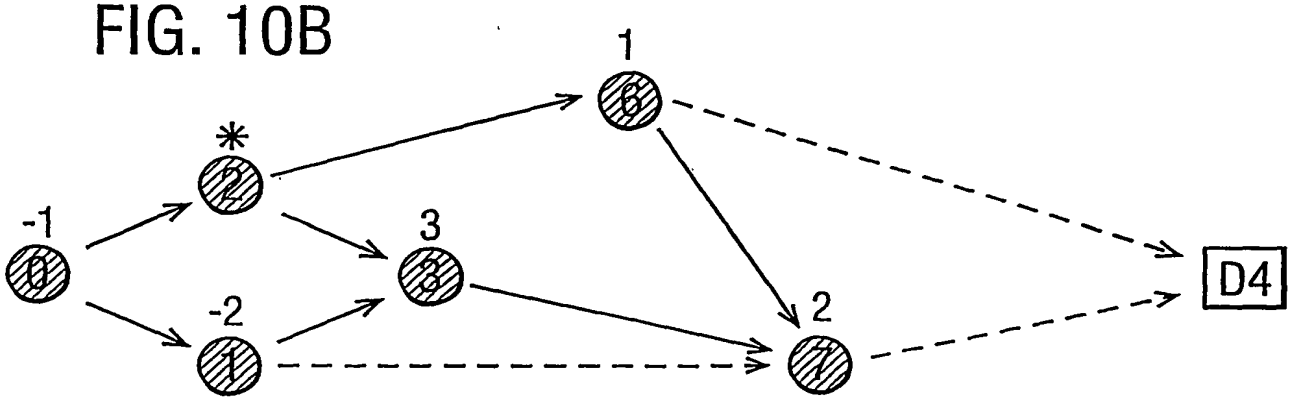



FIG. 10C

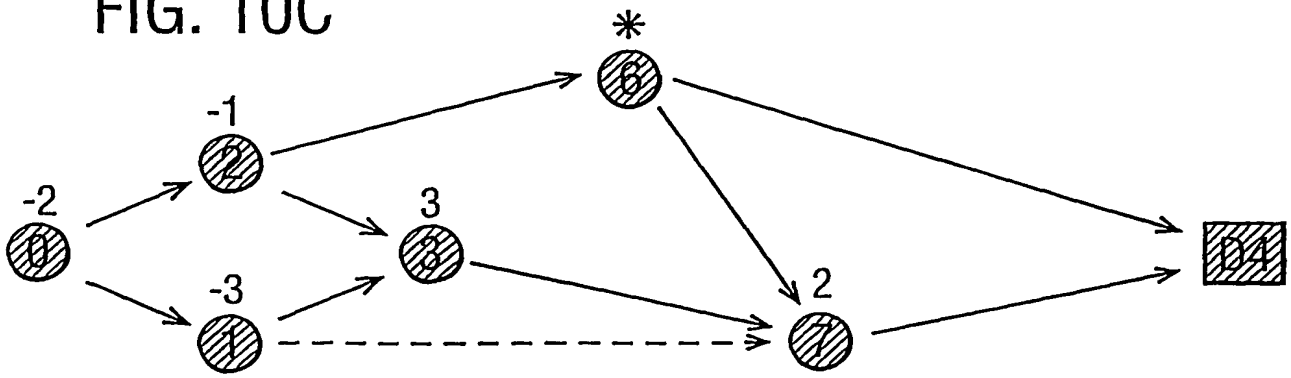


FIG. 11A

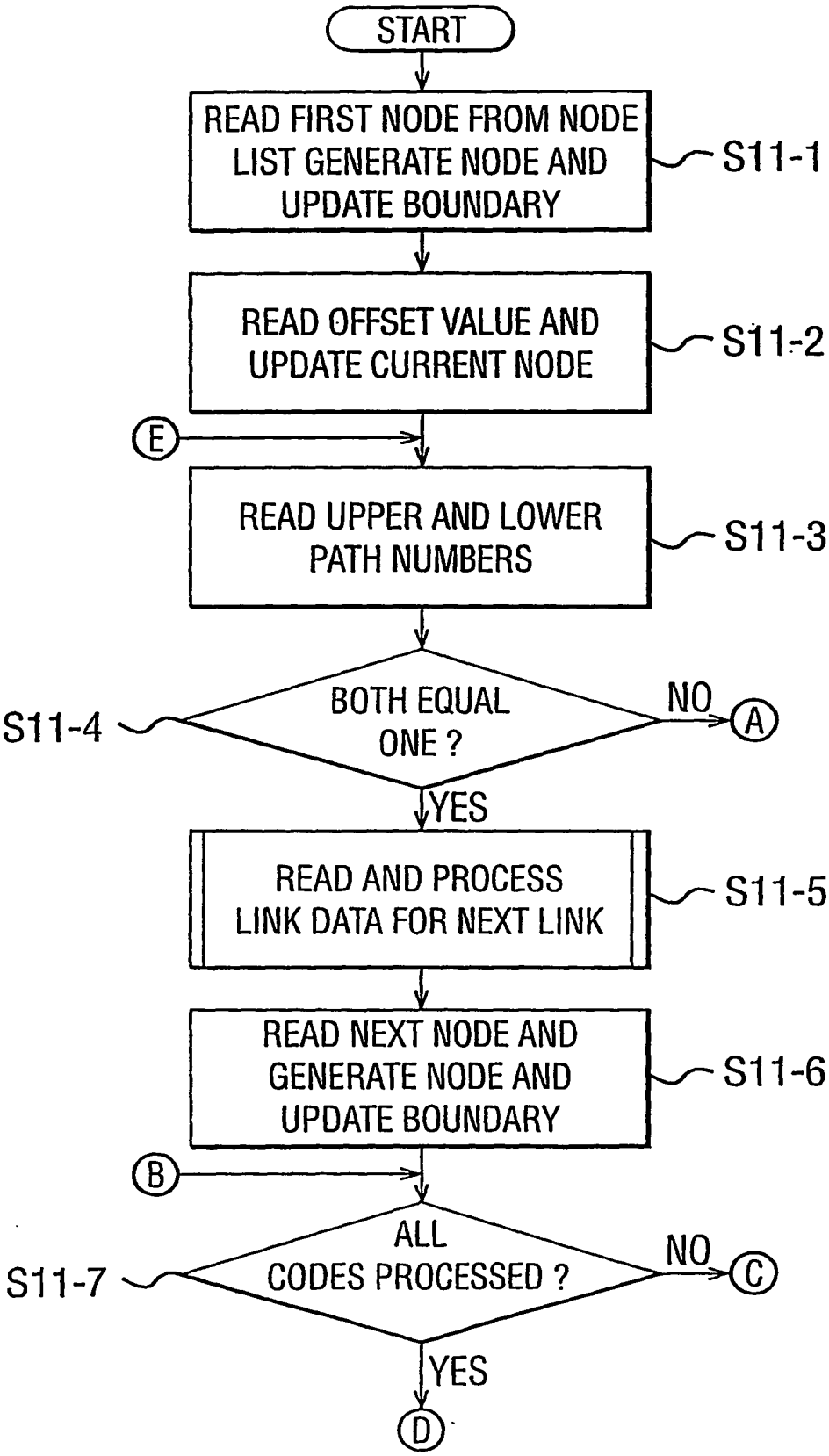

START
READ FIRST NODE FROM NODE LIST GENERATE NODE AND UPDATE BOUNDARY
S11-1
READ OFFSET VALUE AND UPDATE CURRENT NODE
S11-2
E
READ UPPER AND LOWER PATH NUMBERS
S11-3
S11-4
BOTH EQUAL ONE ?
NO
A
YES
READ AND PROCESS LINK DATA FOR NEXT LINK
S11-5
READ NEXT NODE AND GENERATE NODE AND UPDATE BOUNDARY
S11-6
B
S11-7
ALL CODES PROCESSED ?
NO
C
YES
D

FIG. 11B

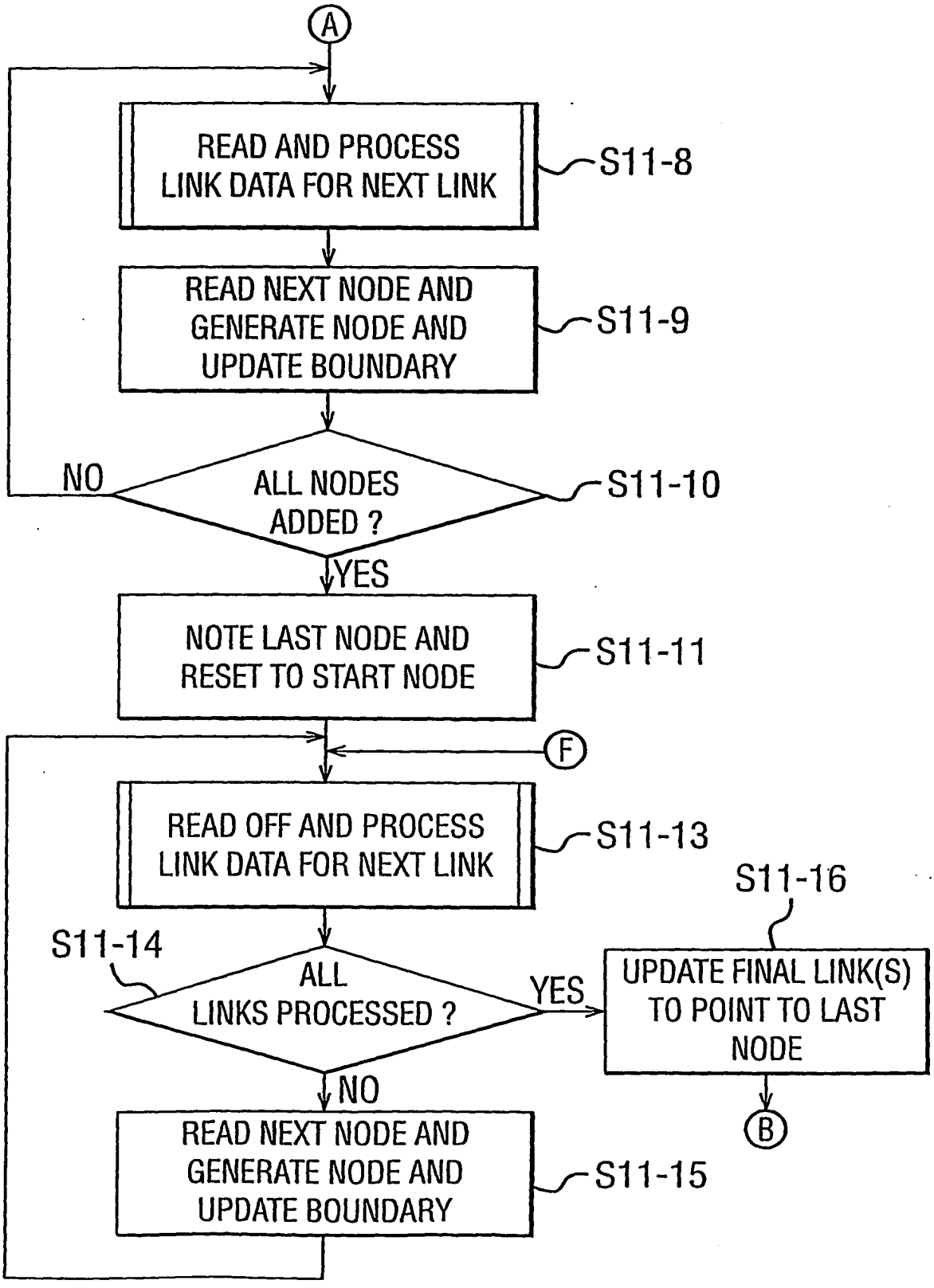

A
READ AND PROCESS LINK DATA FOR NEXT LINK
S11-8
READ NEXT NODE AND GENERATE NODE AND UPDATE BOUNDARY
S11-9
NO
ALL NODES ADDED ?
S11-10
YES
NOTE LAST NODE AND RESET TO START NODE
S11-11
F
READ OFF AND PROCESS LINK DATA FOR NEXT LINK
S11-13
S11-16
S11-14
ALL LINKS PROCESSED ?
YES
UPDATE FINAL LINK(S) TO POINT TO LAST NODE
NO
B
READ NEXT NODE AND GENERATE NODE AND UPDATE BOUNDARY
S11-15

FIG. 11C

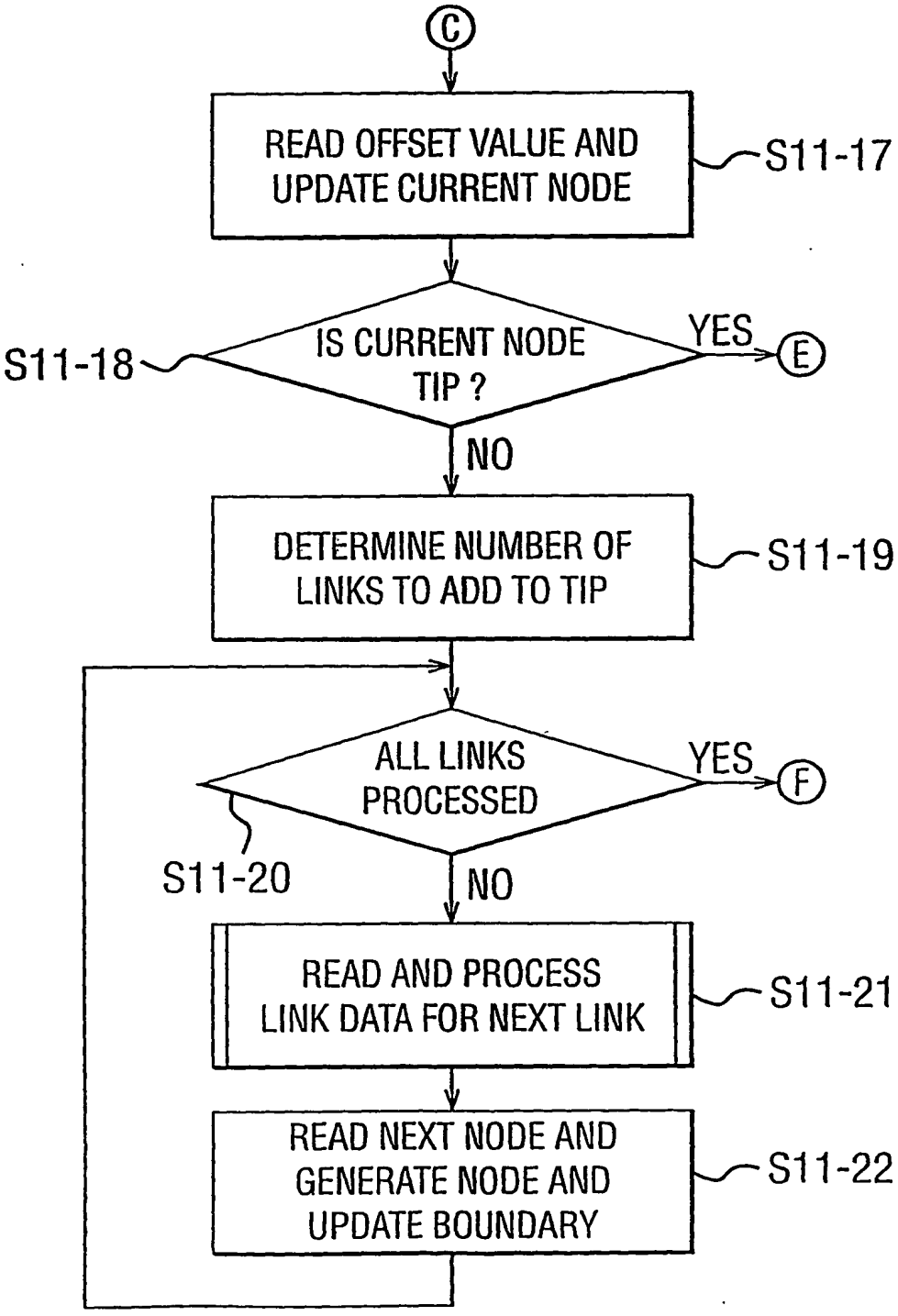

C
READ OFFSET VALUE AND UPDATE CURRENT NODE
S11-17
S11-18
IS CURRENT NODE TIP ?
YES
E
NO
DETERMINE NUMBER OF LINKS TO ADD TO TIP
S11-19
ALL LINKS PROCESSED
YES
F
S11-20
NO
READ AND PROCESS LINK DATA FOR NEXT LINK
S11-21
READ NEXT NODE AND GENERATE NODE AND UPDATE BOUNDARY
S11-22

FIG. 11D

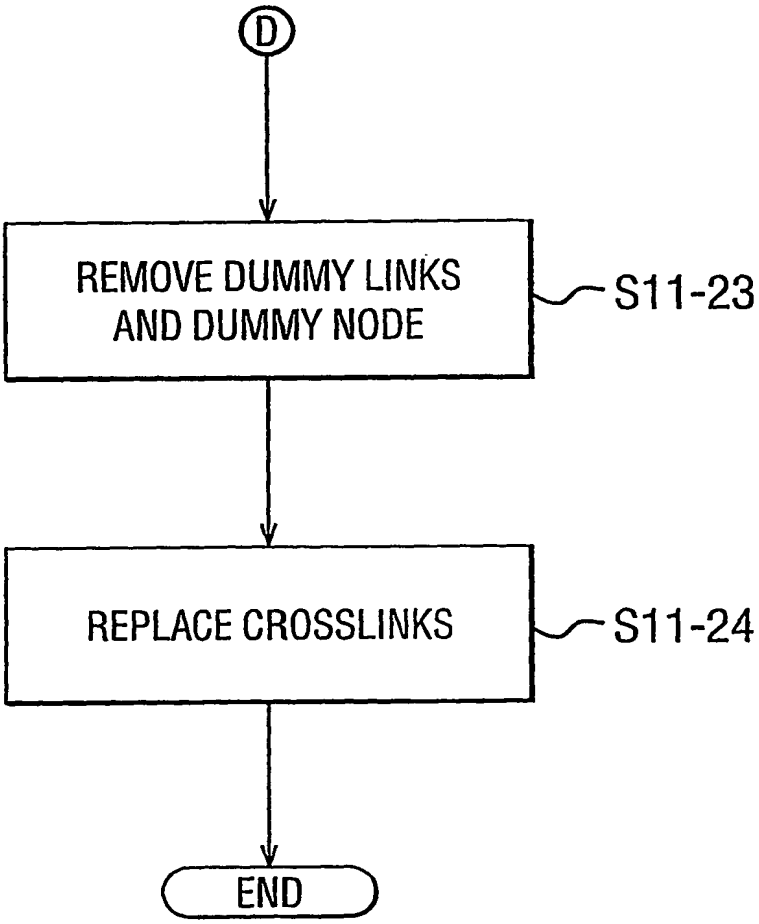

D
REMOVE DUMMY LINKS AND DUMMY NODE
S11-23
REPLACE CROSSLINKS
S11-24
END

FIG. 12

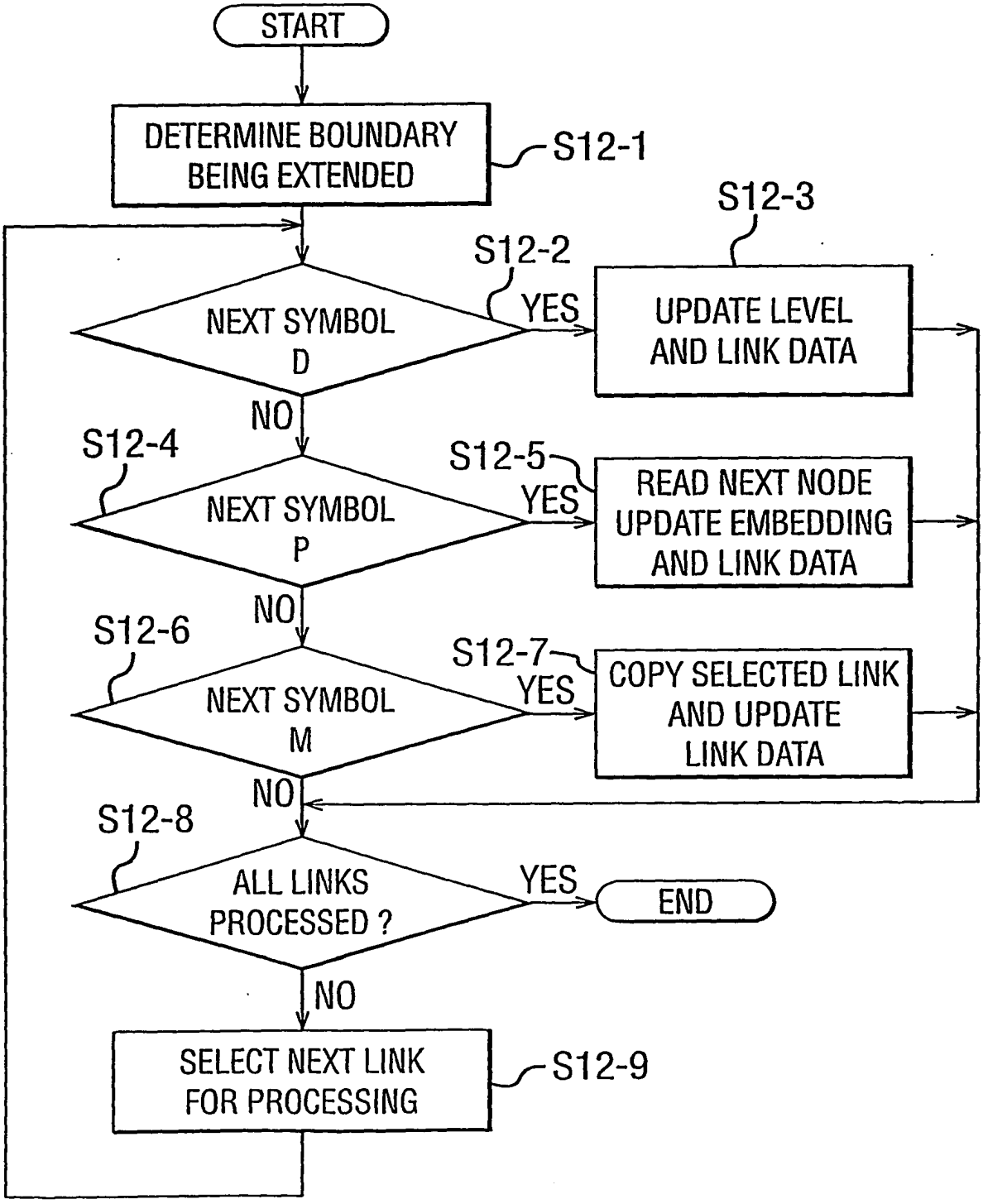

START
DETERMINE BOUNDARY BEING EXTENDED
S12-1
S12-2
NEXT SYMBOL D
YES
S12-3
UPDATE LEVEL AND LINK DATA
NO
S12-4
NEXT SYMBOL P
S12-5
YES
READ NEXT NODE UPDATE EMBEDDING AND LINK DATA
NO
S12-6
NEXT SYMBOL M
S12-7
YES
COPY SELECTED LINK AND UPDATE LINK DATA
NO
S12-8
ALL LINKS PROCESSED ?
YES
END
NO
SELECT NEXT LINK FOR PROCESSING
S12-9

FIG. 13A

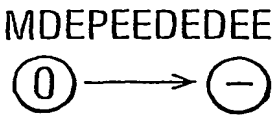



FIG. 13B

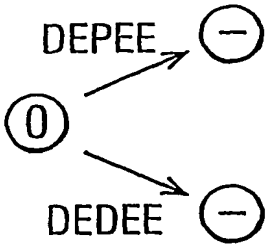



FIG. 13C

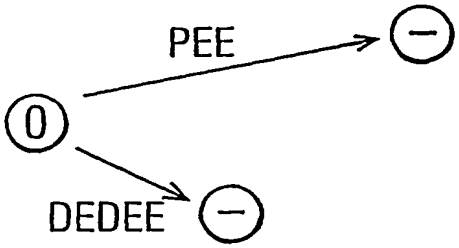



FIG. 13D

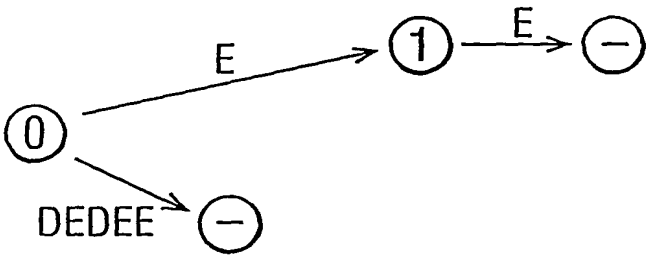



FIG. 13E

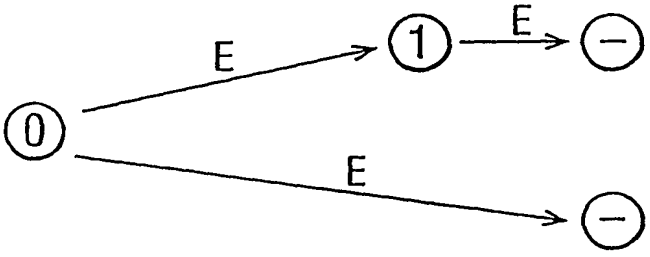



FIG. 13F

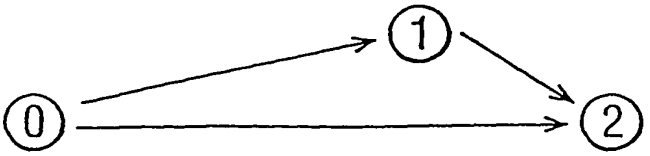


FIG. 14A

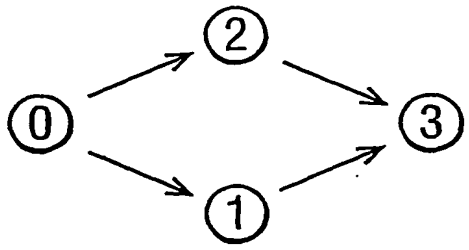



FIG. 14B

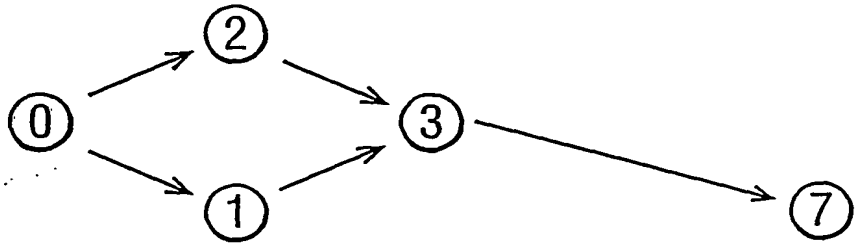



FIG. 14C

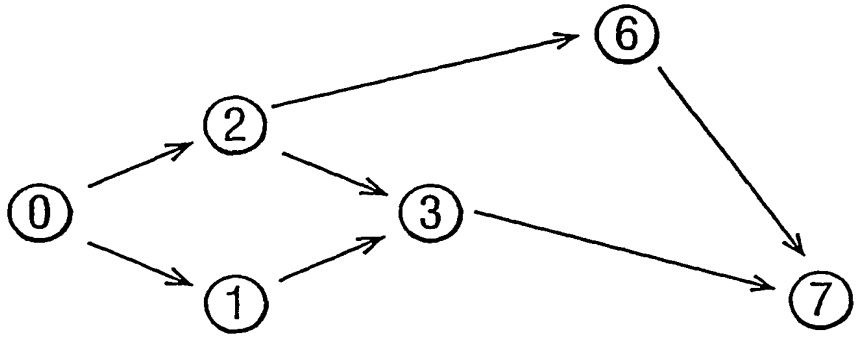


FIG. 14D

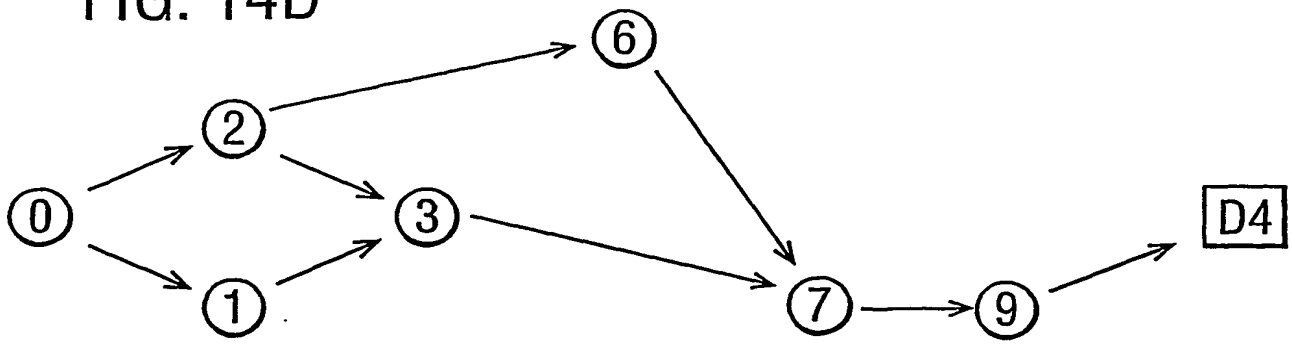



FIG. 14E

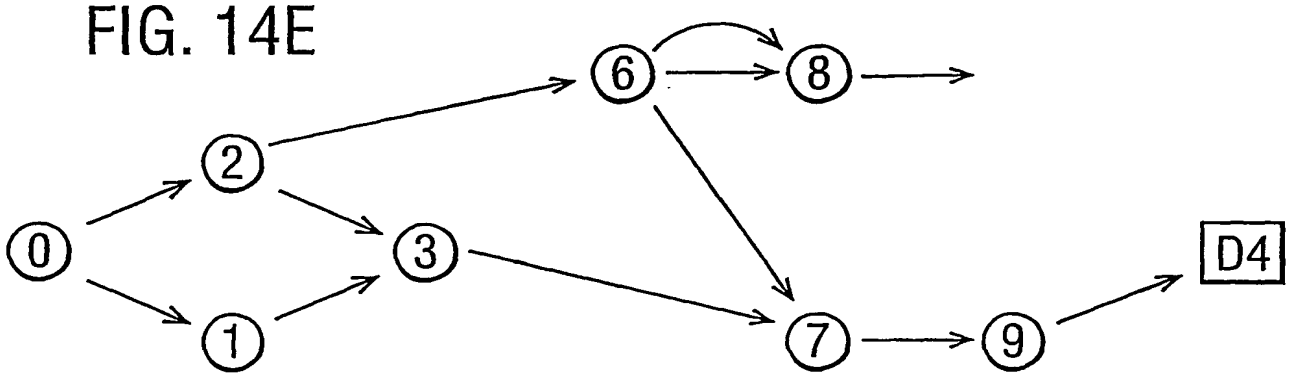



FIG. 14F

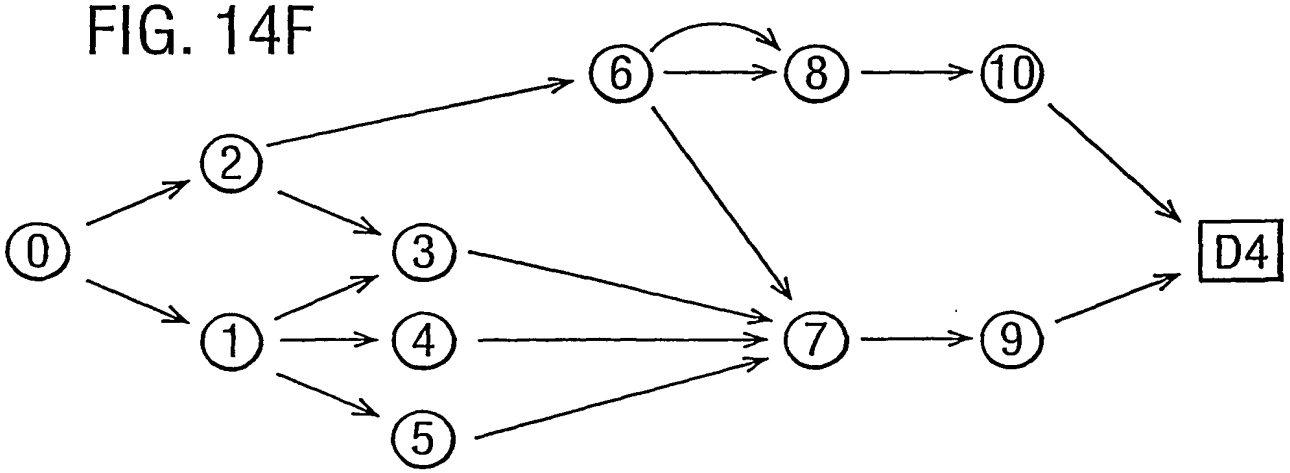


FIG. 14G

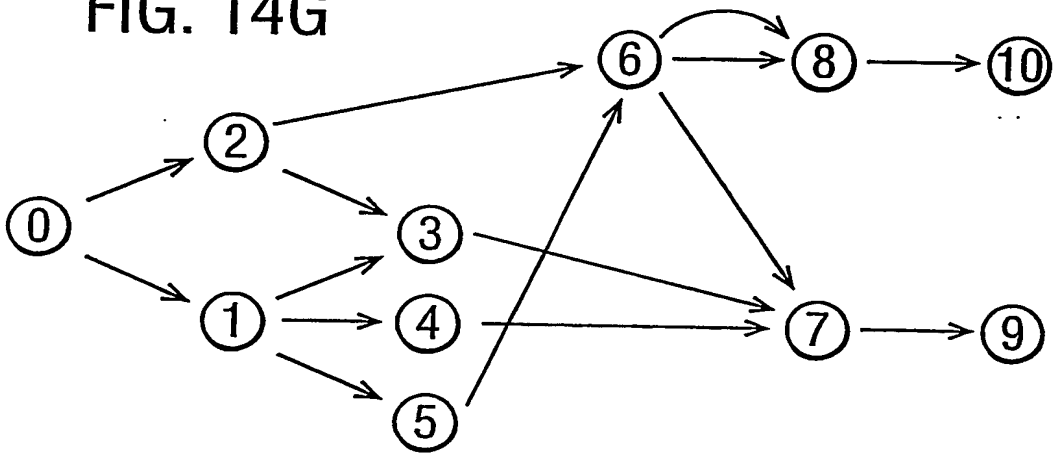
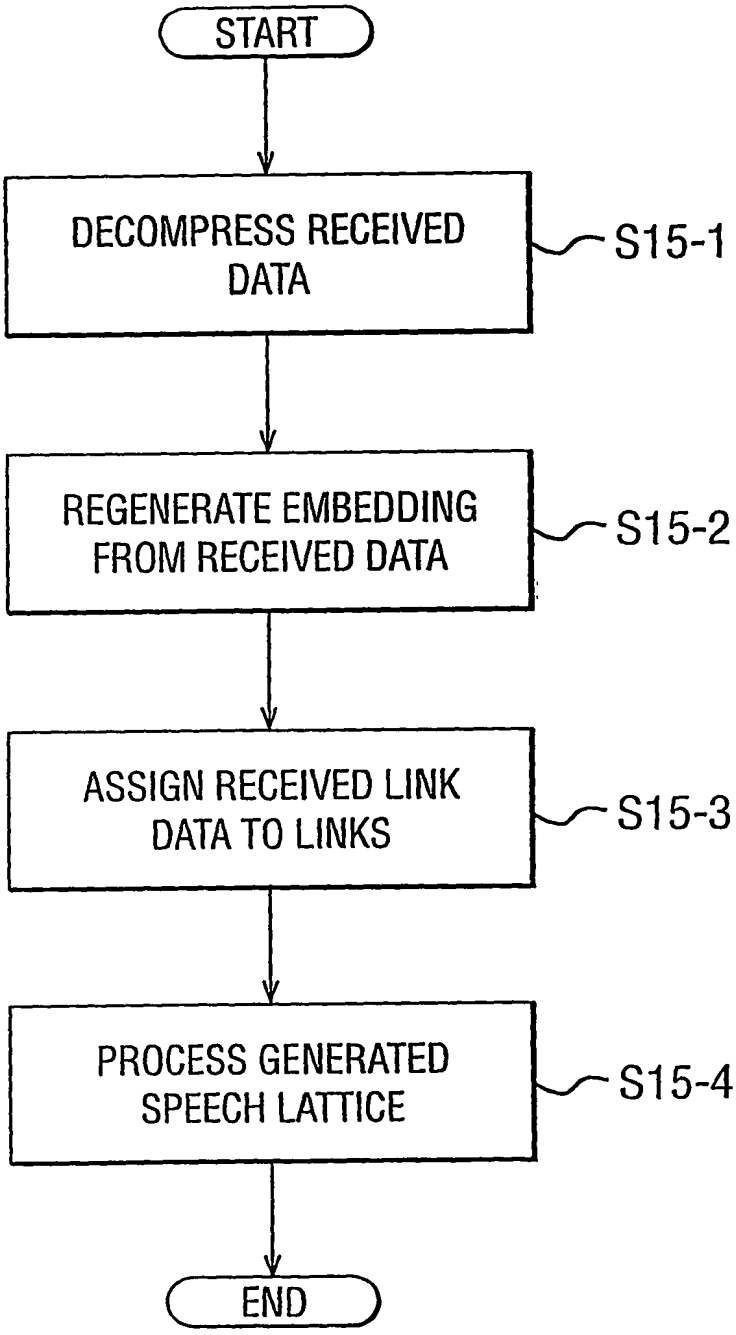


FIG. 15


START
DECOMPRESS RECEIVED DATA
S15-1
REGENERATE EMBEDDING FROM RECEIVED DATA
S15-2
ASSIGN RECEIVED LINK DATA TO LINKS
S15-3
PROCESS GENERATED SPEECH LATTICE
S15-4
END